Making Electricity Markets Work for Everyone

Assessment of the 2003 Energy-Smart Pricing Plan℠

Customer Response to Dynamic Prices and Demand Response Programs
California Energy Commission
At:
SMUD Customer Technology Center
Sacramento, CA

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Agenda

1. Research questions.
2. Importance and relevance to the industry.
3. Summary of the Energy-Smart Pricing Plan^{sm} (ESPP).
4. Overview assessment of the 1st year of the ESPP.
   - Key findings
   - Future research
5. Overall Conclusions

Overview of Assessment

- The ESPP program is one of the first large-scale residential Real Time Pricing (RTP) assessments in the United States.
- Questions addressed by the assessment include:
  - Will residential customers respond to hourly market-based electricity prices?
  - What actions can and do residential customers take to respond to hourly prices?
  - What is the magnitude of the effect, i.e., to what degree can consumption be affected through the behavior and actions of small customers?
  - What are the characteristics of customers willing to participate in an RTP pricing plan?

The Energy-Smart Pricing Plan[sm]

- This is a collaborative effort between:
  - Community Energy Cooperative (Cooperative),
  - Commonwealth Edison (ComEd), and the
  - Illinois Department of Commerce and Economic Opportunity (DECO).
- Objective: Test residential customers' responses to day-ahead, market based prices.
- DCEO provided funding for the interval meters, programmable thermostats and for this year-one assessment.
- The rate is not revenue neutral -- a price discount was offered equal to about 10% savings due to the transfer of price risk from ComEd to the customer.

The Energy-Smart Pricing Plan^{sm} (cont.)

- Started in January 2003, this program uses hourly energy pricing information provided through ComEd.
- Based on historical prices, participants could be expected to save about 10% of their current electric costs.
- The ESPP is available to any ComEd customer willing to join the Cooperative.
- But, initial marketing of the ESPP was targeted to Cooperative members and selected neighborhoods.
- Importantly, about half of the program's participants are new Cooperative members, reflecting the marketing effort that went beyond current members.
- In 2003 more than 750 customer members enrolled in the program.

Key ESPP Elements

- Day-ahead pricing with participants given the next day's prices each hour.
- Customers are informed by:
  - Accessing the Cooperative's website, or
  - Calling a toll-free number.
- High price notification -- whenever the next day's price went above 10¢ in an hour, participants were notified via e-mail or a phone call (generally between 7:00 and 10:00 PM).
- Participants received a price protection cap of 50¢ per kWh.
- AND, participants received energy management information from the Cooperative.

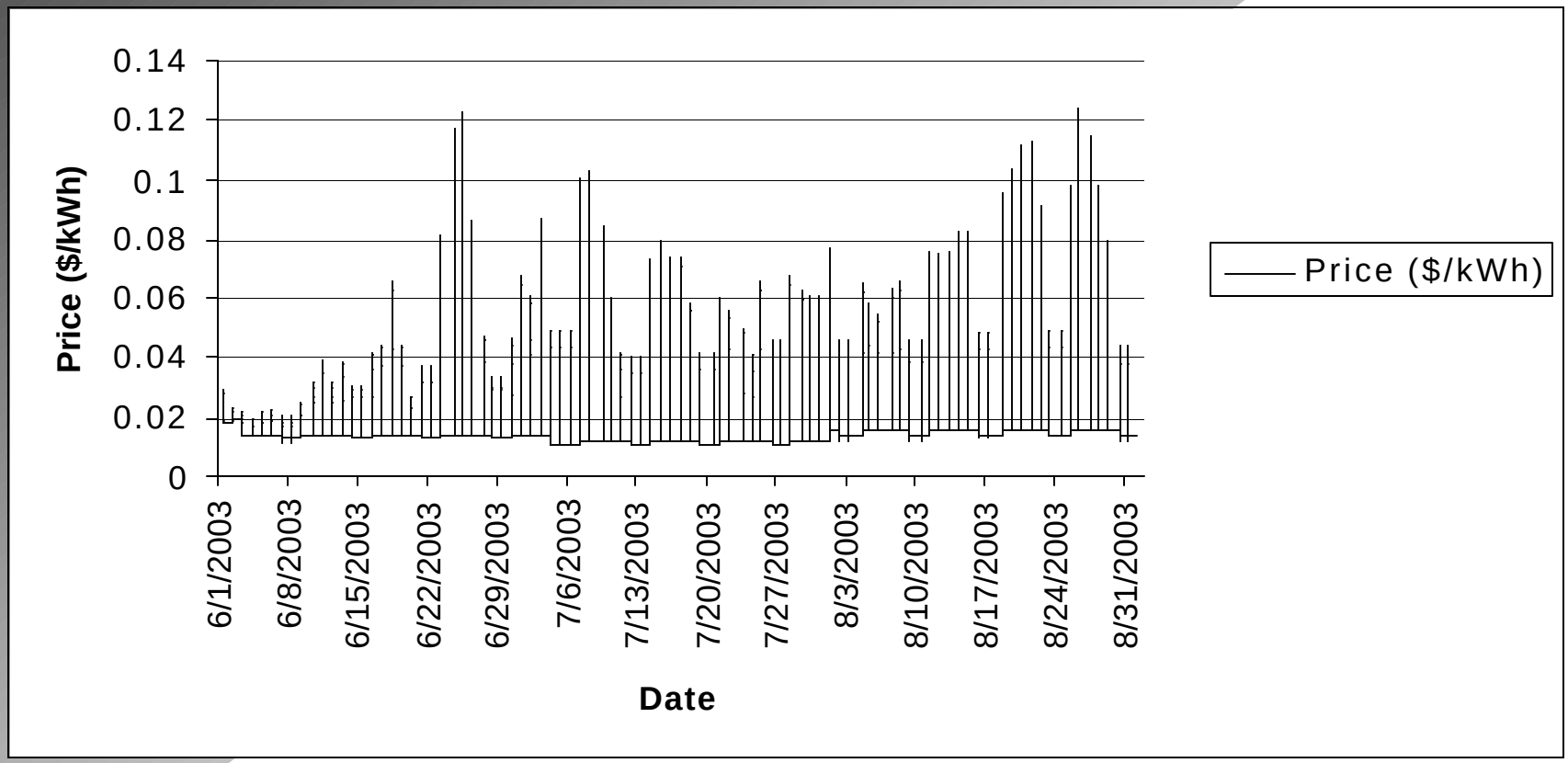
Summer of 2003

- The summer of 2003 was relatively mild in Illinois.
- Only 30 hours during summer where the hourly price was greater than 10 cents.
  - Nine hours in June.
  - Two hours in July.
  - Nineteen hours in August.
- Average price over the summer was $0.033/kWh.
- Prices ranged from a low price of 0.01 per kWh to a high price was $0.12 per kWh.

Year-One Price-Response Assessment

- Data were available both across households (i.e., cross-sectional) and over time (i.e., time-series).
- A statistical analysis examined and controlled for differences between customers, as well as changes in each customers' consumption over the Summer season.
- Estimation of load-shifting in response to price was based on analyses of hourly demands at varying prices.
- The primary inputs were:
  - Interval metered data for participants and the control groups;
  - Hourly weather (temperature and humidity); and,
  - Survey responses.

2003 Hourly Prices



Key Findings

1. Residents responded to peak-period prices:

- Over half of all participants showing significant response to high price notifications (prices over 10 cents per kWh).
- This response tapers off both (1) over the length of the high price period, and (2) as the number of successive days of notifications increase.
- The estimated elasticity is .042 -- a 100% increase in the hourly price of electricity would result in a 4.2% decrease in electricity demand.
- Adjustments in conventional wisdom:
  - This project showed that low-income and multi-family homes can fall into the "high responder" group.

Key Findings (cont.)

- Multifamily homes as a group were more responsive than single family homes.
- Single family homes with central air initially decreased demand, but this effect tapered off substantially in hours 3 and 4 during a multi-hour "high-price" event.
  - Could be due to 1) income effects, 2) behavior, 3) technology, and/or 4) building thermodynamics;
  - But program design, information and technology can probably help sustain the savings.
  - Further investigation is being undertaken.

Key Findings (cont.)

- Over 80% of participants changed their AC use:
  - 20% reported using ACs less during high-price periods and more during low-price periods (i.e., pre-cooling).
  - 20% simply reduced use during high-price periods.
  - 60% reported that they reduced use whenever they could.
    - Implies a conservation impact not accounted for in the model.
- Approximately 70% of participants who had clothes washers indicated they changed their pattern of use.
  - Over half reported shifting washing to low-price periods.
  - Others indicated they lowered overall washer/dryer use.

Actions taken by Participants

1) Adjust AC use
2) Shift clothes washing/drying times.
3) Turn off lights more.
4) Use fans more.
5) Close blinds/shades during day.
6) Spend more time in coolest rooms
7) Install insulation or weather stripping.
8) Various other actions.

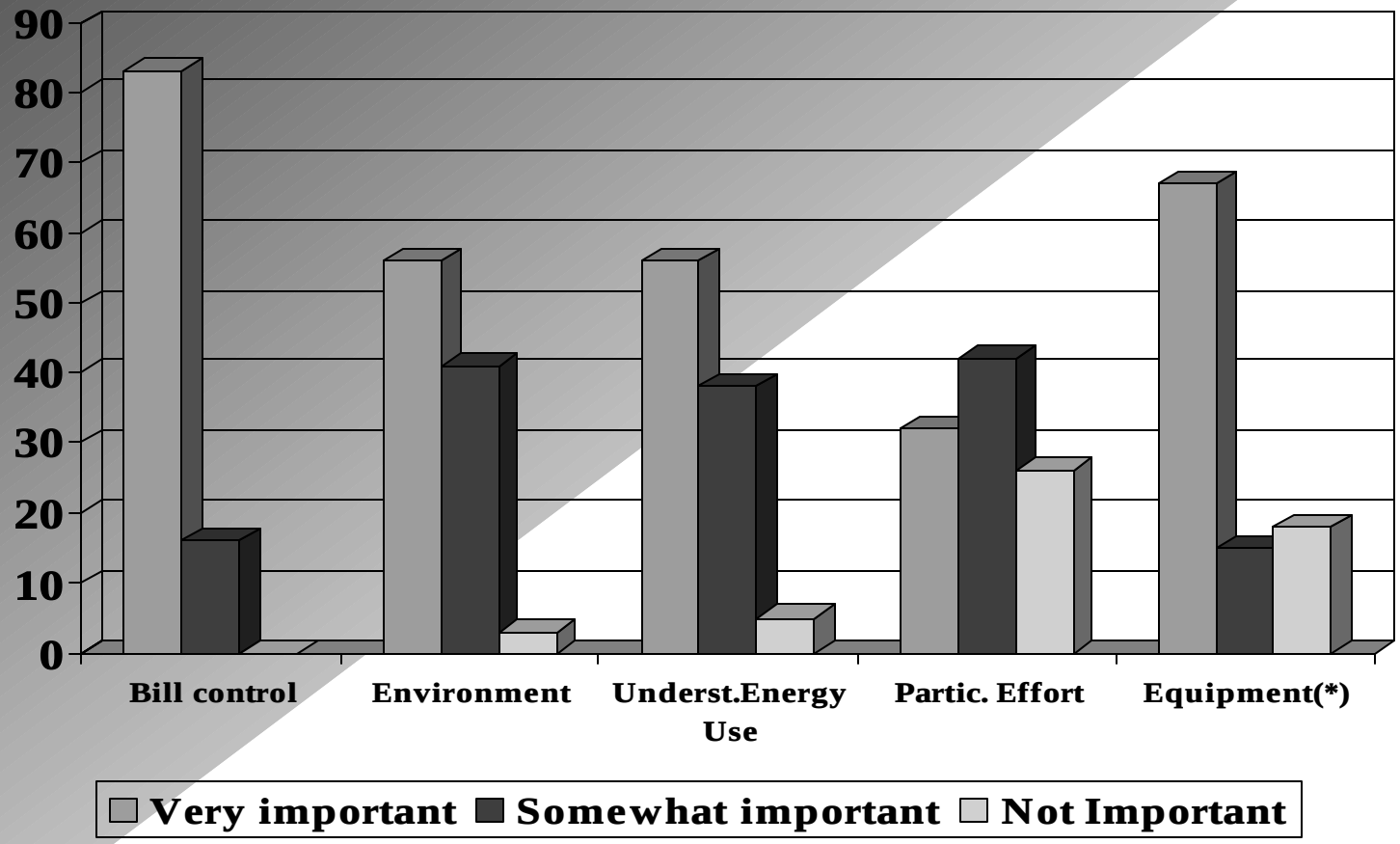
Key Findings (cont.)

2. Participants liked the program:

- ESPP participants were satisfied with the program.
- Participants' interaction with the ESPP was favorable.
- Participants satisfied with savings -- ave. $12.00+/mo.
- Participants cited the following:
  - They liked the partnership between the Cooperative and ComEd.
  - The ability to check on prices.
  - More control over electric bills.
  - Belief that they are part of the solution.
  - Program made them think about their energy-using habits.
  - Helps keep them informed.
  - "Convenient, affordable, reliable and effective."

Importance of Program Benefits

Survey also shows "control" is <u>most</u> important for 77%...



Future Research

- Results for year one need to be verified as the program continues into its next two years.
  - Do participants continue to be responsive?
  - Are there observable characteristics of non-responsive customers that might help marketing?
- Need to quantify benefits at scale and at the system level.
- Need to determine how to adjust system planning to accommodate new price response offerings?
- How to better guarantee changes, e.g., combine pricing with switches for true emergency situations.

Overall Conclusions

- The results of year one of the program are very positive.
- During a relatively cool summer and low peak energy prices, participants had a strong response to high price notifications.
- Participants were satisfied with their participation in the program both:
  - with their bill savings, and
  - they placed value on benefits from the program beyond their direct bill savings.
- Early indications are that:
  - an understandable program for residential customers can be developed, and
  - residential customers can and do respond to price signals.

Request Report

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